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ABSTRACT

In this study, 32 9-year-olds worked with either their parent or a friend to plan routes to carry out errands; following this collaboration, the children carried out another version of the task independently. The study thus focused on (1) the effects on the individual's planning skills of having worked with an adult or with a peer and (2) the differences between individual and collaborative planning. Findings indicated that adult-child dyads planned their routes with significantly more explicit references to the strategies to be used in planning and to the definition and characteristics of the problem. Children who had collaborated with adults produced much more efficient plans than those who had worked with peers. Extent to which the dyad had determined sequences of moves predicted subsequent individual performance. It is concluded that the experience of planning with an adult enhances children's subsequent independent planning skills on a related task. (RH)

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THE INFLUENCE OF COLLABORATION WITH PARENTS VERSUS PEERS IN LEARNING TO PLAN

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Many of children's planning activities occur in social situations where they collaborate with other children or adults, or are supervised by adults. While children undoubtedly learn about planning through their independent efforts, their learning under guidance or in collaboration with others may be especially influential.

According to Vygotsky (1962, 1978), the assistance of adults enables children to participate in more complex activities than would be possible for the children to carry out independently, and this joint problem solving is internalized by children to form the basis of their individual skills. A variety of researchers have elaborated on this idea to suggest the ways in which adults support children's learning (e.g., Bruner, 1983; Rogoff & Wertsch, 1984; Saxe, Gearhart, & Guberman, 1984; Wertsch, 1979; Wood, Bruner, & Ross, 1976). Rogoff (in press) summarizes the processes involved in the collaborative socialization of cognition as follows:

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> Adults provide guidance in cognitive development through the arrangement of appropriate materials and tasks for children, as well as through tacit and explicit instruction occurring as adults and children participate together in activities. Adults' greater knowledge and skill allow them to assist children in translating familiar information to apply to a new problem, and to structure the problem so that the child can work on manageable subgoals. The effectiveness of adults in structuring situations for children's learning is matched by children's eagerness and involvement in managing their own learning experiences. Children put themselves in a position to observe what is going on; they involve themselves in the ongoing activity; they influence the activities in which they participate; and they demand some involvement with the adults who serve as their guides for socialization into the culture that they are learning. Together, children and adults choose learning situations and calibrate the child's level of participation so that the child is comfortably challenged. (p. 25)

The feature of adult-child interaction that we consider especially important to children's learning of planning skills is that adults provide models of mature problem-solving while involving children in the process. Adults handle the more complex aspects of a task, leaving children free to concentrate on those that are within grasp. In particular, adults structure tasks for children, handling executive decisions of how to go about reaching the goals, segmenting the tasks, and keeping goals in mind. For

example, the joint cleanup of a young child's room may require the adult (even with a cooperative child) to define the goal of cleaning up the room, to segment the task into subgoals such as picking up dirty clothes and putting toys in their proper places, and to determine the specifics of each subgoal (e.g., can you find all the blocks and put them in the box?). Adult structuring of problems is likely to be tailored to children's level of skill, with children involved in the processes of setting goals, segmenting subgoals, and making specific decisions as their skills allow. While adults may take primary responsibility in difficult tasks, directing children toward goals, segmenting tasks, and modeling and explaining their decisions, children are participants in decision-making, not passive observers.

Observational studies of parent-child interaction have provided detailed accounts of these parental roles and children's involvement (Rogoff & Gardner, 1984; Saxe, Gearhart, & Guberman, 1984). However, there have been few studies specifically examining the effect of interaction with adults on children's later independent performance. To investigate the impact of adult support of children's cognitive development, we studied the influence of collaboration with parents versus peers on children's later independent planning.

Though there is some research suggesting that peers can enhance each others' learning (Allen, 1976; Gauvain & Rogoff, 1985; Perret-Clermont, 1980), in this study it was assumed that whatever guidance peers might provide would be less skilled than that of adults in a complex planning task. This assumption is consistent

with previous studies comparing effectiveness of adult and peer teachers (Ellis & Rogoff, 1982; Steward & Steward, 1974). Ellis and Rogoff (in press) noted that in a complex cognitive activity, child teachers focused their attention on the immediate actions required to carry out the task, and seemed to lose track of larger goals, while adult teachers were able to manage both the immediate actions necessary to carry out a task and coordinate these with the overall goal.

Skills in coordinating actions with goals are essential in planning problems, and it is precisely these skills that are more difficult for young children to handle. In complex planning problems calling for consideration of alternatives before acting, young children are likely to plan solutions one step at a time rather than formulating a course of action that coordinates several actions in an integrated sequence (Gardner & Rogoff, ms., Magkaev, 1977; Wellman, Fabricius, & Sophian, in press).

In this study, 32 9-year-old children worked with either their parent or a friend to plan routes to carry out errands, and following this collaboration they carried out another version of the task independently. The study thus focused on the effects of having worked with an adult or a peer on the individual's planning skills, as well as the differences in the planning carried out collaboratively.

The errand planning task is similar to one used by Goldin and Hayes-Roth (1980), in which the objective is to plan the shortest possible shopping route that includes all the necessary stops on a map of an imaginary town (see Figure 1). The children worked on two

such errand planning tasks with a partner (parent or friend), and then worked on a third one by themselves. In the dyadic trials, each person was supplied with a list of errands to coordinate with the other person's errands in an overall plan. Two lists were given to maximize the involvement of both dyad members. The task was not introduced as a teaching situation but one of collaboration. On the individual trial, each child handled the planning of two lists as in the previous dyadic trials. The lists specified the stores on the map at which a given item could be obtained, and in some cases gave alternative stores (see Table 1). For each trial, the optimal route involved somewhat different stores but approximately the same route.

For the collaborative planning trials, we were interested in the extent to which either member of the dyad explicitly referred to strategies for planning or the definition of the planning problem, the extent to which they surveyed the locations of the stores on the map before determining a specific route, and the predominance of decisions involving only one destination at a time versus decisions that involved determining a sequence of integrated moves to some or all of the stores. These variables represent some of the conceptual planes of Hayes-Roth and Hayes-Roth's (1979) Opportunistic Planning Model, used with adult planners. Excluding cases in which one coder missed an action coded by another coder, reliability ranged from 77% to 100%. If omissions were treated as disagreements, reliability dropped to 50% to 75%.

The findings indicated that adult-child dyads planned their routes with significantly more explicit references to the strategies to be used in planning and to the definition and characteristics of the problem. Adult-child dyads surveyed the locations of the stores on the map more extensively prior to making decisions regarding the route, and were more likely to integrate several stores into their decisions so that moves involved sequences of destinations rather than only a single store at a time. The peer dyads typically identified the store closest to the current location, checked to see if that store was on either list, and then made a move without considering whether there was a more efficient way to sequence the stops, or whether including the alternative store available for some items would produce a shorter route. The adult-child dyads typically surveyed the layout of the stores before making any decisions, considered a tentative route between the mandatory stores and incorporated the more suitable alternative stores to produce plans involving sequences of some or all of the stores to be visited.

It was the adults in the adult-child dyads that were responsible for strategy statements, problem definition discussions, and planning sequences of moves. However, the children in the adult-child dyads were responsible for surveying the layout of the stores on the map to a much greater extent than children in the peer dyads, and they were much less likely to propose step-by-step moves than were children in the peer dyads. They were equally likely to propose sequence moves.

Of greatest interest was whether participating in sophisticated planning with adults would affect the children's subsequent independent errand planning. Indeed, when they handled the planning task independently, the children who had collaborated with adults produced much more efficient plans than those who had worked with another child. Since there was no need to communicate during the individual trial, planning strategies could not be determined in the same fashion as in the dyadic trials. However, almost all children from the adult-child pairs started the third trial with a search for the mandatory and alternative stores on the map. Virtually no child from the peer dyads showed such evidence of considering how the destinations related to each other.

To determine which aspects of the collaborative planning trials might relate to children's independent planning performance, we examined the predictiveness of each of the strategies observed in the dyadic trials in a multiple regression analysis, controlling for whether the child's partner was an adult or a peer. The three variables which had a significant simple correlation with children's independent performance were whether the partner was an adult or a peer, the extent of sequence decisions in determining routes, and the extent of surveying the layout prior to making decisions. Explicit discussion of strategies or of the problem definition did not relate significantly to the individual child's subsequent independent performance. The three significant variables were highly intercorrelated, and when they were entered together in multiple regression equations, all three dropped in predictiveness.

The variable that maintained the greatest contribution to predicting individual performance in the regression analysis was the extent to which the dyad had determined sequences of moves, which was slightly higher than whether or not the child's partner was an adult or a peer. This result suggests that the better performance of children who had collaborated with adults may be largely due to their involvement in the more sophisticated strategy of coordinating several pieces of the problem to produce a plan maximizing multiple considerations. Of course, this speculation is based only on correlational data linking performance with experience with this strategy, and the link may not be causal.

This study does indicate that the experience of planning with an adult enhances children's subsequent independent planning skills on a related task. It supports the notion that even when a situation is not explicitly instructional, collaboration in problem-solving with an adult can enhance children's skills. Yet to be determined is what exactly children internalize from their experience in sophisticated planning in collaboration with adults, and how this internalization occurs.

Figure 1 - A map of an imaginary town with an example of an optimal route.

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Figure 2

An example of a pair of lists of errands.

- silk flowers from the Florist
- uniforms from the Theatrical Supplies
- belts from the Dress Shop
- wallpaper from the Discount Store or from the Hardware Store
- acrylic paint from the School Supply or from the Bookstore

and

- hair spray from the Beauty Shop
- repaired stereo from the Appliance Store
- stage decoration from the Children's Library
- paint brushes from the Paint Shop or from the Shopping Center
- glue from the Drug Store or from the Toy Shop

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